

## **Draft Internal Assessment Resource For planning purposes only**

**Draft standard Physics 2.2:** Demonstrate understanding of physics relevant to a selected context

**Resource reference:** Physics 2.2B

**Resource title:** Vehicle Crumple Zones

**Credits:** 3

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### **Teacher guidelines**

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The following guidelines are designed to ensure that teachers can carry out valid and consistent assessment using this internal assessment resource.

Teachers need to be very familiar with the outcome being assessed by Achievement Standard Physics 2.2. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing students against it.

### **Context/setting**

This assessment is a directed research assignment – students perform research and prepare a report describing the physics of a vehicle crumple zone.

### **Conditions**

Research and report writing should be performed individually, outside of class time (approximately 4 hours of effort).

Confirm the format of the report with students. The format could be, but is not limited to:

- written report (including illustrations, diagrams and graphs, if appropriate)
- poster presentation (including annotations or supporting notes)
- project booklet
- multi-media (for example, a recorded video presentation or web page with embedded video, graphics, and text)
- computer presentation software file.

Non-text formats, for example, an oral presentation, must be supplemented by a written list of references.

All sources of information, images, diagrams (not generated by the student) and data must be acknowledged. All sources of information must be recorded in a traceable format which means that someone else could go straight to where the information came from.

## Resource requirements

Ensure students have access to a range of secondary information sources, for example, science magazines, science websites, Alpha resources, other Royal Society resources, and the following websites:

- [www.howstuffworks.com](http://www.howstuffworks.com)
- <http://www.physicsclassroom.com/class/momentum/u4l1c.cfm>.

## Additional information

None.

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Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of physics relevant to a selected context.	Demonstrate in-depth understanding of physics relevant to a selected context.	Demonstrate comprehensive understanding of physics relevant to a selected context.

**Student instructions**

**Introduction**

Physics principles have real applications. For example, understanding the physics of car crumple zones and how they help to reduce the severity of injury to the vehicle occupant during a collision is essential in car design.

You will research the physics of vehicle crumple zones. This is a concept first introduced by Mercedes-Benz in the 1950's, and was first used on their W111 Fintail cars. It showed how vehicles could be made with front and rear structures that be deformed in a controlled manner.



In this assessment, you will research the physics of vehicle crumple zones, and prepare a report that explains the relevant physics principles.

**Task**

Working independently, perform research to gather information on the physics of car crumple zones. Process this information and produce a report that uses the relevant physics principles to explain how car crumple zones work.

Confirm the format of the report with your teacher, for example, a written report, a poster or computer presentation. Present and submit your report by <insert date>.

Your report could include the following

- why speed is an important factor in car accidents
- an explanation, in terms of physics theory for how crumple zones are effective in reducing the severity of injuries in a collision.

Put all material copied from other sources in quotation marks.

Your report will be assessed on how well you integrate or link descriptions of the related physics to the context of bridge design, for example, by justifying, elaborating, or analysing how or why the described physics applies to this context.

## Assessment schedule: Physics 2.2B Vehicle Crumple Zones

Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
<p>Student correctly:</p> <ul style="list-style-type: none"> <li>identifies and describes the characteristics of the physics related to the given context</li> <li>describes how and/or why the physics applies to this context.</li> </ul>	<p>Student correctly:</p> <ul style="list-style-type: none"> <li>identifies and describes in-depth the characteristics of the physics related to the given context</li> <li>provides reasons how and/or why the physics applies to this context.</li> </ul>	<p>Student correctly:</p> <ul style="list-style-type: none"> <li>comprehensively identifies and describes the characteristics of the physics related to the given context</li> <li>elaborates how and/or why the physics applies to this context</li> <li>justifies why the particular physics is well-suited to this context, and/or compares alternatives, for example, cable-stay bridges vs. truss bridges.</li> </ul>

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.